

Zero Retries issue 0142 2024-03-08

Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with 1300+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0142>

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Hamvention 2024, No. 🙄

Hamvention 2024 in Xenia, Ohio, USA on 2024-05-17 thru 19, countdown - ~~19~~ ~~18~~ ~~17~~ ~~16~~ ~~15~~ ~~14~~ ~~13~~ ~~12~~ ~~11~~ 10 weeks!

This week, Tina KD7WSF and I had our *final* Go / No Go meeting about attending [Hamvention 2024](#) in Xenia, Ohio, USA and decided that Hamvention 2024 was a *No Go* for us. We've had some significant, necessary financial hits this year already, and thus attending Hamvention 2024 in a couple of months isn't within our financial means at the moment.

To answer the question in advance, the revenue from Paid Subscribers to Zero Retries are very much appreciated, but

that revenue (to date) is basically offsetting some expenses that I incur in publishing Zero Retries.

I'll continue the Hamvention 2024 countdown here in Zero Retries because it's my guess that at Hamvention 2024, as the largest Amateur Radio event in the world, some interesting announcements and developments will emerge. As of Hamvention 2024, the Amateur Radio industry and electronics manufacturing in general will have experienced a full year or so of "normal" component availability, full factory capability, and as the severity of COVID-19 has waned, there's increased interest in attending large events such as Hamvention. For the same reasons, I expect [HAM RADIO 2024](#) in Europe to also be a great Amateur Radio conference.

Paid Subscribers Update

My thanks to **Ron Sparrow N7RDE** for becoming a Paid Subscriber to Zero Retries this past week!

My thanks to **Will Gwaltney WA4GK** for becoming a Paid Subscriber to Zero Retries this past week!

My thanks to **Prefers to Remain Anonymous 24** for becoming a Paid Subscriber to Zero Retries this past week!

Financial support is a real vote of confidence for continuing to publish Zero Retries.

Zero Retries Isn't Authoritative...

New subscribers to Zero Retries sometime mention (privately) how much they enjoy learning about what's happening in "Zero Retries Interesting" Amateur Radio, that Zero Retries informs them about.

Thus I feel compelled to periodically explain here in Zero Retries... somewhat as a disclaimer... that I *don't* consider what I, and the contributing authors, discuss here in Zero Retries to be an authoritative, comprehensive overview of *all* Zero Retries Interesting developments.

There is far more Zero Retries Interesting activity going on in Amateur Radio and adjacent / relevant to Amateur Radio than I can cover in a weekly newsletter.

Some weeks, like this one, I can only cover perhaps 20% of what's *actually* occurring. I "bookmark" *many* more interesting developments than I'm able to mention in Zero Retries. And, there are times when I *decide not to discuss a very interesting development* because I simply cannot do justice to them within the limited time and space I have available here in Zero Retries. One example is the incredible amount of activity now occurring with [Meshtastic](#), [LoRa](#) for hobbyist use, and [Reticulum Network1](#). Seeing daily glimpses of Meshtastic activity on several Facebook groups reminds me of the explosion of activity in the 1980s of the early years of Packet Radio.

As I write this... *mid-week*, in the past hour I've bookmarked approximately ten interesting articles, knowing that I'm only going to be able to cover two or three of them at most in this week's Zero Retries. And, there's rarely time / space to "catch up" on past Zero Retries Interesting developments, because *more occur... daily*.

In the end, I'm an individual writer, working part time to write Zero Retries, and trying to balance my time and energy to actually *be doing Amateur Radio* (and other fun technical activities) in my life². To really do justice to the *full scope of Zero Retries Interesting developments* in, and adjacent to, Amateur Radio would require a small staff (such as the [staff of Amateur Radio Newsline](#)), to look at, evaluate, and write up Zero Retries Interesting developments and publish on a *daily* basis. That's a fun fantasy, but hardly realistic. Offsetting that, I take comfort that, at least Zero Retries as it is now is surfacing some Zero Retries Interesting developments that few others are mentioning.

Zero Retries Content Distributed via Amateur Radio?

I was asked a few weeks ago if I had any objections to having Zero Retries content distributed via Amateur Radio, such as Packet Radio networks. I don't have any objections... in fact, I'd be honored for that to happen.

To make my perspective clear, I've updated the "boilerplate" at the end of each issue of Zero Retries (starting with this issue) to include:

Blanket permission is granted for Amateur Radio use of any Steve Stroh content in Zero Retries for Amateur Radio newsletters and distribution via Amateur Radio such as (but not limited to) Packet Radio Networks, Packet Radio Bulletin Board Systems, Repeater Nets, etc.

In such usage, please provide appropriate authorship credit for the content.

The reason I don't do so myself is that, for me, Zero Retries is a "[*pecuniary interest*](#)" (however modest). Thus US Amateur Radio regulations prohibit *me* from distributing Zero Retries content *via Amateur Radio*.

But for *others* to distribute Zero Retries content via Amateur Radio, who are unaffiliated with me or Zero Retries, and *not at my request*, I don't see any pecuniary interest issues.

Distilled Wisdom - Ham Radio... Now What?

I was looking for something else when I found a wonderful talk by N0AX - [Ham Radio... Now What?](#) from the 2015 ARRL and TAPR Digital Communications Conference (DCC) where N0AX was the banquet speaker. Given that I'm primarily a reader, *I rarely recommend a video or audio recording* and admittedly *I* don't usually accept recommendations to claim an block of my time to watch a video or listen to an audio. Thus this is one of my rare such recommendations - *this* talk is worth watching³.

H. Ward Silver N0AX is a nexus in Amateur Radio. For decades now he has seamlessly blended the many disparate facets of Amateur Radio, between the deeply technical aspects (designing, building, experimentation) with the operational aspects (DXing, contests) with the big picture of Amateur Radio (he was staff, and is now a contractor with ARRL), and a perspective of Amateur Radio from the "real world". N0AX is also an accomplished author (Ham Radio for Dummies, now in its 4th edition, is a favorite gift of mine to those expressing an interest in Amateur Radio)... and a mandolin player. I think of N0AX as the Robert Fulghum of Amateur Radio for his down-to-earth observations of the "Amateur Radio condition".

In this talk, N0AX offers distilled wisdom of what is next for Amateur Radio, and what Amateur Radio is going to have to do to get there *successfully*, and some thoughts on how to bridge the gap. This is a talk that I'm going to watch several more times as it's essentially a "business plan" for what I'm trying to accomplish with Zero Retries in exposing Amateur Radio to a new generation of techies to perhaps interest them in a career in radio technology... because we (US and Western society) really need radio technologists... and lots of them... and soon (~~now~~... *yesterday*).

One primary takeaway... if we in Amateur Radio want to get the attention of this younger generation, we have to meet them where *they* are... which probably means that if I want to realize the potential of Zero Retries, I'll have to get Zero Retries onto Discord, video, and other media that I'm less comfortable with than text. I've known this, but I've been reluctant to embrace that truth, but N0AX makes a compelling case for doing so.

A second takeaway from N0AX's talk is that I'm going to try to add the [International Microwave Symposium \(IMS\)](#), which N0AX called "The World Series of RF", to my schedule, perhaps next year, to try to gather info and represent Amateur Radio.

My thanks to Gary Pearce K4AAQ for the excellent video recording of this and other talks at the 2015 DCC and other DCCs, and of course TAPR and especially (then) TAPR President Steve Bible N7HPR for his leadership in hosting the DCC over the recent decades.

73,

Steve N8GNJ

Leave a comment

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Phil Karn KA9Q on Amateur Radio Experimentation

By Steve Stroh N8GNJ

During his appearance on the 2024 NTIA Spectrum Policy Symposium, Panel Session - Pillar Four - Growth of the Spectrum Workforce, Phil Karn KA9Q offered two major perspectives about Amateur Radio to the other panelists and the audience. The first, and more dominant, of those perspectives (given the assigned topic of the panel) that was that Amateur Radio can be a component of getting younger folks interested in radio technology, and then possibly into academics and a career in radio technology (growing the “Spectrum Workforce”).

But the second point KA9Q made (several times) was probably overlooked - that Amateur Radio is a great “proving ground” for experiments and experimentation in radio technology.

KA9Q said:

... When it comes to technical experimentation is we often do things before anybody else is interested. A good example of that is that in the mid 80s I wrote an Internet Protocol package for the PC. As far as I know it's the first one that was a complete implementation and we were running the internet protocols over radio in the 1980s when nobody else was interested.

...

That's another thing about ham radio I think is fascinating is that we do stuff simply because it's fun and that's often long before anybody has any thought of doing commercial use of this stuff. As far as I know the only other people doing this at that time were the military and doing it with extremely expensive hardware. We were doing it with something we could afford as individuals. So not only did we experiment, we innovate, and we educate. I think we also innovate and often very early... much earlier you might think.

...

But [also don't] forget the potential of the ham service to contribute to direct experimentation with some of the problems you're talking about. In the Amateur [Radio] Service no one station owns a frequency. We have to sign every time we renew our licenses. It says no amateur station owns the frequency. We have to share, so we've already had to deal with these problems of spectral sharing, mutual interference, and dynamic allocation for a long time. I personally have gotten very interested in trying these out on the ham bands. In 1990 I came up with one of the techniques for dynamic spectrum sharing. [That] sounds an awful lot like what I've been hearing recently about where you get on and say “Hey I need to listen here for a certain period of time, please stay off that frequency.” I did this in 1990; I was doing it for ham radio. I didn't know... had no idea that anybody would do anything like that. Later it made its way into Wi-Fi; it's one of the features of Wi-Fi.

So we do have potential not only for education I think but some small scale experimentation especially in the fields where apparently other people were having problems. I was surprised to hear about problems with communication between different groups who are sharing the spectrum or in going through the kinds of regulatory approvals you need to to operate a new waveform. Hams have a lot of regulatory flexibility as long as we stay within rules (one and a half kilowatts maximum power output), we have to stay in the band, stay in the bandwidth limits, [and] don't intentionally interfere with anybody. We can do pretty much what we want and that does seem to be a very big advantage of the ham service. So on a small scale and perhaps on an academic scale we can try some of these things and I'm certain we would be delighted if some of the results were useful to the larger spectrum sharing community.

The story about the Qualcomm “AI Wireless” chip, combined with KA9Q's suggestion of experimentation triggered a memory from watching a DCC talk by Bob McGwier N4HY who stated (paraphrased, from fallible memory) that “machine learning (ML) is going to be *huge* in radio technology”. At the time, that statement sounded prescient, but I now know that in N4HY's *it's classified; I can't talk about it* day job, he had already been observing (or perhaps creating) machine learning being applied to radio technology... *for years*.

I was working on an article about the use of AI / ML in Amateur Radio (actual usage, not the usual “AI wrote part of this article”), but I couldn't finish it satisfactorily for this week's issue, so it's deferred to a future issue.

ka9q-radio

One near-term project that Amateur Radio could easily start experimenting with is creating integrated communications systems out of many disparate systems - using inexpensive compute power and Software Defined Receivers (and perhaps transmitters), and no small amount of ingenuity and out-of-the-box thinking. KA9Q's project [ka9q-radio](#) is one example. For the price of an antenna, Software Defined Receiver, and a Raspberry Pi 4, it's now feasible to monitor all the 20 kHz (repeater and simplex) channels on any VHF / UHF band... or *all of 50-54 MHz, 144-148 MHz, 219-225 MHz, and 440-450 MHz* for the price of four receivers and four computers. It's probably sufficient to use a [discone antenna](#) as the combined antenna for all four receivers.

To create an "omniradio", you just "pipe" the output of ka9q-radio into a "console" and when your system sees a transmission of interest, the system automatically selects an appropriate radio for a transmission, tunes that radio to the appropriate frequency, and transmits.

Hailing Channel(s)

Another concept, ripe for experimentation in Amateur Radio is creating Hailing Channels. I sent this note to the members of the [APRS Foundation Board](#) earlier this week:

APRS Foundation Leadership:

Now that the APRS Foundation is getting itself settled as a functioning organization. I understand that APRS Foundation still has a lot of "backlog" work to do that falls to it in the wake of WB4APR's death, but I think it would be beneficial for APRS Foundation, and its role within Amateur Radio, to have a vision for the future.

Thus I have a suggestion for a long-term, futuristic project that I think fits well into the APRS Foundation's role, that would extend the concepts of APRS well into the future - create a Hailing Channel system.

I recommend that all of the APRS Foundation board watch this video:

It's titled "A Hailing Channel for Packet Radio" and it was presented by Bryan Hoyer K7UDR (cc'd on this email) at the 2012 ARRL and TAPR Digital Communications Conference. Unfortunately this video predates YouTube's implementation of captions or transcripts, so I can't offer text excerpts that get the primary points across here in an email.

I think that a Hailing Channel is an incredibly powerful concept and in *this era of SO many new data*

modes, all sharing our Amateur Radio VHF / UHF bands, most of which cannot interoperate (for example, higher speed packet radio using IL2P, VARA FM, M17, and New Packet Radio cannot “see” each other), a Hailing Channel where different modes can “announce” themselves (N8GNJ, at location X, is using VARA FM on 222.123) in a common format, would be a really incredible capability. Such a capability to accommodate “mixed modes” would be unique to Amateur Radio and really demonstrate technological innovation is actively occurring in Amateur Radio.

The idea of segmenting our VHF / UHF bands rigidly by static band plans to segment various modes is, frankly, a concept of the past century. Band plans, repeater guides, etc. are outmoded concepts given how dynamic our new Amateur Radio usage can be - using one mode on one frequency and using another mode on a different frequency, etc. *We need some system that is dynamic and real-time* to help all Amateur Radio users understand “what’s going on, where, and when”, and I think that the Hailing Channel concept that K4UDR discusses is at least the genesis of such a system.

I think Hailing Channels should be established on each VHF / UHF band, and within each band, the frequency should be flexible, other than the very long-established 144.39 MHz for the original, legacy, APRS at 1200 bps AFSK AX.25. For example, if you decide to load the “Hailing Channel software” onto a computer, which is connected to a Software Defined Receiver, the receiver would immediately begin “scanning” for the Hailing Channel “universal marker beacon” to find the Hail Channel frequency on each band, in the local area, and if nothing is found (for example, few users of the 222-225 MHz band), the software would suggest creating a Hailing Channel on the quietest frequency that it found on 222-225 MHz.

I don’t think there is *anything* that APRS Foundation could do *that would be more impactful to future Amateur Radio* than to implement the Hailing Channel concept that Bryan discusses in this video.

Given that this presentation was given in 2012, and it’s now twelve years later, you might think this concept is outdated. I don’t think that’s actually the case - I think that a Hailing Channel was just a bit ahead of the technology that could make it a reality. In 2012, we barely had the technologies that could make the concept of a Hailing Channel a reality. Now we have Raspberry Pis and other embedded computers that could be dedicated to a Hailing Channel in each Amateur Radio station, we now have inexpensive and very good Software Defined Receivers, including units like the KrakenSDR (<https://www.crowdsupply.com/krakenrf/krakensdr>) that could monitor Hailing Channels on all five Amateur VHF / UHF bands simultaneously.

I suggest that the APRS Foundation make the creation of a Hailing Channel standard an official project. Now that APRS Foundation is a 501(c)(3) it can apply for a grant from ARDC to pay for the work to create a Hailing Channel standard, and with a grant secured, it could issue a Request for Proposals to DO the work to create a Hailing Channel standard. Or, if ARDC isn’t willing to provide a grant without a solid proposal, reverse my suggestion and issue a Request for Proposals, choose the most promising one or two (hedge your bets) and then seek a grant from ARDC.

Why APRS Foundation? Because it’s the only organization within Amateur Radio that has any “standing” to implement the Hailing Channel concept, and it now has a 501(c)(3) enabling it to seek grants from ARDC to pay for such work to be done.

Lastly, if you watch to the end of the video, Bob gave his blessing to the Hailing Channel concept.

The primary takeaway from these three points

- KA9Q observing that **Amateur Radio is ideal for experimentation** with new radio technologies,
- **ka9q-radio** providing us with a new “receive it *all, simultaneously*” capability beyond the convention of a single radio / “scanning the band”,
- The idea of a **Hailing Channel**

... are all things that could easily be accommodated within Amateur Radio and provide Amateur Radio with capabilities that simply aren’t possible with other radio services.

Then, layer on N4HY’s observation that “machine learning (ML) is going to be huge in radio technology”.

The possibilities for new radio technologies being developed within Amateur Radio just stagger the imagination.

Leave a comment

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KiwiSDR 2 Availability, and Receiver Servers

By Steve Stroh N8GNJ

This story is a great example of why I don't consider Zero Retries as "authoritative" on Zero Retries Interesting developments because I cannot keep up with, nor report out on all things Zero Retries Interesting such as the revival of the KiwiSDR into the KiwiSDR 2.

This story could be considered a continuation of the previous story about providing new, experimental capabilities in Amateur Radio that just aren't possible in other radio services.

I last wrote about the very Zero Retries Interesting KiwiSDR project in **Zero Retries 0112** - Update to KiwiSDR In Progress on 2023-08-18. Since then, I had not tracked, nor reported on the progress of that project. In that interval, the design update of the KiwiSDR to KiwiSDR 2 was completed and the first production run was built and shipped to customers. The second production run is sold out and in process, and a third production run is in work, and (I think... the website is ambiguous) you can [get in the queue to purchase a unit from the third production run](#). I think the process for that is to [send an email](#) expressing your interest.

A quick refresh on the concept of the KiwiSDR:

The [KiwiSDR] is different from other SDRs. It is a standalone device that attaches to your local network and is optionally accessed through the Internet. A browser is used to connect to the user interface. Most other SDRs generate raw IQ data and need to be connected directly to a PC or laptop running OS-specific, installed software.

Browsers supported include Firefox, Chrome, Safari and Opera on Windows, Linux and Mac. A version of the interface for mobile devices is under development. Until then the browser interface will work on iPad and Android devices with a large enough display. The Kiwi supports up to four simultaneous connections each with their own independently controlled audio and waterfall channels. An extension interface allows advanced signal decoding directly in the browser interface without installing additional software. The most popular is the integrated WSPR decoder and Time Difference of Arrival (TDoA) signal direction finder. The Kiwi also includes a software-defined GPS receiver used to calibrate the SDR frequency and obtaining time-of-day.

The use case of the KiwiSDR is pretty specific - a "conventional" receiver (as in, tune one frequency at a time to listen / decode) with the advantage of remote operation via a web browser, with the receiver and "server" being pre-integrated.

But the bigger picture of remoted a Software Defined Receiver (SDRx) that can receive all of 0-30 MHz simultaneously, and stream that data, it struck me that SDRx units could be used by an Amateur Radio Operator... or Operators - as their *primary* receiver. The idea would be to create a "receive server", or ["Receiver as a Service" at a good location where there is minimal noise, and good connectivity](#). The "receive server" would stream the data of from the receive server via various broadband connections such as a fast data stream on 420-450 MHz (if the FCC agrees to remove outmoded maximum bandwidth regulations) or 1240-1300 MHz, or using microwave networking, or reliable Internet connectivity like Starlink and IPv6.

What I'm imagining, that seems different, is that a remoted SDRx can become, essentially, the receiver stage for *all* of an Amateur Radio Operator's HF operations. Instead of trying to use an HF receiver *at your location*, which may be in a poor "radio" location such as when you cannot put up an external antenna, or experience excessive noise on the HF bands (cheap switching power supplies noise).

One example that's applicable to this scenario is that loop antennas for HF require tuning adjustments for the frequency you want to transmit on, which compromises the ability to receive on other frequencies in the band, or other

bands. Using a KiwiSDR or other SDRx unit in the above scenario lets you continue to receive all HF frequencies in a band, or other bands. Thus you can adjust the loop antenna as needed to transmit, without regard to the effect that would have on being able to receive.

Thus you could build a customized, unique-to-you HF transceiver, largely out of software. The receive portion of the “radio” display could be the output of the remoted SDRx, and the transmit portion of the the “radio” display could be whatever transmit system you have at your location, and it would look integrated, just as if you were using a conventional transceiver.

This seems, to me, to be a powerful new capability in HF radio communications.

But, such a scenario isn’t limited to HF; this scenario is also feasible for VHF / UHF operations with the use of [ka9q-radio](#) described in the previous article. In a nutshell, ka9q-radio marries a reasonably capable computer with a compatible SDRx and can simultaneously receive all standard (20 kHz) channels in a VHF or UHF band. KA9Q is able to receive all repeaters in the San Diego, California area on 144-148 MHz, 222-225 MHz, and 440-450 MHz with the use of three SDRx units and three Raspberry Pi 4 computers.

Thus the same “Receive Server” paradigm is possible in VHF and UHF, effectively decoupling receivers from transmitters.

Conceivably, we could simplify, and cost-reduce data communications in Amateur Radio considerably by building new generations of Amateur Radio data communications equipment as transmitters-only - because we no longer need the receivers to be integrated. It would also extend to the old idea of cross-band operation. If everyone is able to receive all of the VHF / UHF channels, then they can transmit on whatever band is convenient, and everyone else would be able to receive those transmissions.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

[Amateur Radio on Raspberry Pi 5](#)

Community event hosted by Quantum Technology Club

This event is organised by and for Raspberry Pi enthusiasts

7 Mar 2024

7.45pm – 9.45pm GMT

WI Hut, Aughton

Town Green Ln

Aughton, Ormskirk L39 6SF

United Kingdom

Amateur Radio is a fascinating hobby that enables amateur techies to experiment with all forms of wireless communication, learn about space weather and the effects it has on worldwide communication, communicate with other radio amateurs around the world, and also get started in space communications with satellites and the astronauts on the International Space Station. Modes of communication available to radio amateurs include Morse code, voice, computer data, wireless VOIP (Voice over IP) like digital voice, imagery and video. Licences to transmit are easily obtained by most, whilst the ability to receive does not require a licence and can be enjoyed by all.

Raspberry Pi 5 is the latest, fastest and most powerful model released to date. Previous versions have been pressed into service for uses in the field of amateur radio, but this new version promises to make communications smoother and enable radio amateurs to truly multi-task whilst communicating.

We will endeavour to show you how to set your Raspberry Pi 5 up with some of the most popular amateur radio applications, connect it to a radio receiver/transmitter and receive/communicate.

What's notable about this (now past) event was that it *wasn't* organized by *an Amateur Radio group... it was organized by a **Raspberry Pi** group.*

[AREDN Recent Software Updates First Quarter 2024](#)

We're still quite a ways from an AREDN software Release Candidate and there's been many useful updates in the nightly builds. Here's a summary of what's new in the nightly builds (some very cool stuff!)

A few items that leaped out at me from this long list:

- Added support for Wireguard tunnels
- Added x86 to SUPPORTED_DEVICES
- New supernodes no longer have access to legacy tunnels
 - Legacy tunnels will be removed from supernodes in the next prod release
 - NOTE: in the distant future, legacy tunnels will be completely removed. Migrate to Wireguard tunnels now and avoid the rush :-). They're way better anyway.

It's interesting to note the new inclusion of Wireguard tunnels in AREDN, given that the future 44Net VPN service from ARDC also uses Wireguard tunnels. Hmmmm... perhaps some compatibility will emerge, though not quite ARDC providing an ARDEN tunnel *server* as I've been advocating to ARDC for some time.

[Minnesota Amateur Radio Technical Society](#)

Minnesota Amateur Radio Technical Society was formed in March 2012 with the purpose of furthering the technical side of amateur radio. Our intent is to expand this site to make available presentations from our meetings, general technical resources relating to amateur radio, and provide a forum for technical discussion.

More club information

Use the hamburger menu in the upper left to navigate this site.

We have a Tech Net on Mondays @ 7:00PM on the 146.25/85 repeater network, details here on RepeaterBook.

Please subscribe to our mailing list or consider attending a meeting.

Meetings are being conducted on the first Saturday of each month at 1:00pm at the Minnetonka Community Center.

I'd never heard of that symbol (three stacked horizontal bars) be referred to as a "hamburger", but they're right - that's a *great* name for it.

But, mostly, anytime I encounter an Amateur Radio Organization with the word **Technical** in it, I can't resist mentioning it in Zero Retries and perhaps providing that organization a bit more publicity. Before I encountered MARTS, I'd been considering if it's feasible to create a statewide Amateur Radio organization for *Washington* that, like MARTS, would "[further] the technical side of Amateur Radio"... **WARTS**.

[Bert Modderman PE1RKI Engineer Products](#)

I sell for 2400-2410mhz:

800mw in 25w out 160 euro

5 watt in 100 watt out 175 euro and 225 euro with extra copper

80mw in 100 watt out 250 euro and 300 euro with extra copper

build in circulator is 75 euro extra and screw on external type is 100 euro extra.

200 watt amplifier is 520 euro, with copper insert, the circulator option on this can only be external.

I am working on a higher variety of power amps.

I think I learned of PE1RKI's website (and business) from someone wanting a unique antenna, perhaps for use with one of the microwave bands for an Icom IC-905. I'm in awe of the many small, intensely technical businesses like PE1RKI that exist solely to support small technical small communities within Amateur Radio.

[Space Force Eyes Smaller, Cheaper GPS Satellites to Augment Constellation](#)

A network of 31 GPS satellites 12,000 miles above Earth broadcast positioning, navigation and timing signals.

...

Lockheed Martin is now making a more advanced version of the GPS III, called GPS IIIF. The Air Force in 2018 awarded Lockheed Martin a contract worth \$7.2 billion for up to 22 GPS IIIF satellites. Ten have been ordered so far.

...

Companies were asked to submit concepts for a demonstration of smaller and cheaper GPS satellites that would "inform future planning for the GPS enterprise," SSC said. "There is no formal follow-on to the GPS IIIF program at this time."

At the very end of the article was this:

Separately from the GPS program, the Space Force is doing market research to [identify commercial navigation technologies](#) that could be integrated into military systems to augment or back up GPS in case of outages or jamming attacks.

That article begins:

For decades, the Global Positioning System (GPS) constellation has reigned supreme as the world's go-to navigation tool — guiding everything from aircraft carriers to Uber drivers.

But GPS is susceptible to jamming and spoofing. Malicious actors can deliberately disrupt or manipulate the signals, leading to inaccurate or misleading positioning information.

These vulnerabilities endanger critical infrastructure, emergency response and military operations, prompting increased interest in alternative PNT, or positioning, navigation and timing technologies that do not depend on GPS.

While the Pentagon has long pursued augmented GPS capabilities, including using allied backup systems, it is now scoping a burgeoning commercial market promising innovative options to reduce GPS dependence.

In response to the military's call for PNT alternatives, companies are lining up with offerings to fill gaps if GPS ever goes dark. These range from terrestrial networks that leverage existing cellular infrastructure to new constellations of low-orbiting small satellites broadcasting PNT signals.

Back in the "Doodlebugging" phase of my checkered technical career, which predated GPS, for precision position

determination our ship, we used a very complex integration of:

- Digitized (weighted damping) input from the ship's gyrocompass,
- Honeywell [ring laser gyro](#) the size of a small filing cabinet (don't bump it, and you'd be docked pay if you ever set a coffee cup on top of it),
- Doppler sonar (when we were in shallow enough water to get a return),
- Transit navsats (two passes per day!),
- The most expensive [LORAN-C](#) receiver that was available,
- All of the above were inputs to an HP 1000 computer (it had to be rugged given the environment),
- Two human *naviguessers*, each working a 12 hour shift.

When our ship was close enough to shore, we used a terrestrial [Syledis](#) system for even higher precision position determination.

The system operated in the UHF segment of 420-450 MHz. It was manufactured in France by Sercel S.A., headquarters Carquefou, and was operational during the 1980s and until about 1995.

420-450 MHz? Hmmm... you don't say...

[Leave a comment](#)

[Share](#)

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out **Join the Fun on Amateur Radio** for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything*!
- **Founding Members who generously support Zero Retries financially:**
 - Founding Member 0000 - Steven Davidson K3FZT
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- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your [QRZ](#) page (or other web presence) and include a link:

<https://www.zeroretries.org>

- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- [Dan Romanchik KB6NU](#) mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- [RTL-SDR Blog](#) - *Excellent* coverage of Software Defined Radio units.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

Zero Retries is currently using the [Substack email publishing platform](#) to publish Zero Retries. It's particularly suitable for small newsletters as you can get started for no cost.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join **1300+** other subscribers:

Subscribe now

Please tell your co-conspirators about Zero Retries — just click:

Share Zero Retries

Offering **feedback or comments** for Zero Retries is equally easy — just click:

Leave a comment

If you're a fellow smart person that uses **RSS**, there *is* an **RSS feed for Zero Retries**.

Social Media:

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

[Zero Retries / N8GNJ on Mastodon](#)

Zero Retries (N8GNJ) is also on Bluesky — [@n8gnj](#) — just click:

[Zero Retries / N8GNJ on Bluesky](#)

Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

2024-03-08

Blanket permission is granted for TAPR to use any Steve Stroh content in Zero Retries for the TAPR Packet Status Register (PSR) newsletter (I owe them from way back).

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1

As the Reticulum documentation mentions very prominently...

It is not possible to establish unencrypted links in Reticulum networks.

It is not possible to send unencrypted packets to any destinations in the network.

Thus it's a bit problematic to use Reticulum on US Amateur Radio spectrum... though it would make an interesting Part 5 Experimental License experiment to see how well it *would* work.

2

An exception to “excessive butt-in-chair time” is, at the moment, is that I *am* devoting large blocks of “butt-in-chair time” to writing the Zero Retries book. Other than that, my self-imposed “rule” is that at *this* stage of my life, I *don't*

want to be a *professional* writer “about” Amateur Radio that spends more time *writing* about Amateur Radio than *doing* Amateur Radio.

[3](#)

If you’d really prefer text, see [N0AX’s speaking notes](#), or the “[transcript](#)” automatically generated for videos in Internet Archive.